

REMARKS

This paper responds to the Office Action mailed on February 15, 2007.

Claims 1, 7, 8 and 11 are amended, no claims are canceled, and no claims are added; as a result, claims 1-8, 11-24 and 26 are now pending in this application.

The claim amendments contained here find support in the specification as originally filed and no new matter has been added. In particular, the asperities may be found in figure 1B and at least at page 5, line 13 and page 6, line 2.

Information Disclosure Statement

Applicant submitted an Information Disclosure Statement and a 1449 Form on November 20, 2003. Applicant notes that the first reference 3,665,241 was not initialed. Applicant respectfully requests that an initialed copy of the 1449 Forms be returned to Applicant's Representatives to indicate that the cited reference has been considered by the Examiner. Applicants are submitting a courtesy copy of the 1449 Form herewith.

§102 Rejection of the Claims

Claims 1-3, 5-6, 11-21, 23-24 and 26 were rejected under 35 U.S.C. § 102(b) for anticipation by Doan et al. (U.S. 5,372,973). Applicant respectfully traverses this rejection.

Doan discloses forming self aligned gate structures around cathode emitter tips using chemical mechanical polishing (CMP). The emitter tip may have a sputtered "low work function material" (see figures 6A and 6B, and col. 6, lines 29-56).

Applicant respectfully disagrees with the Examiner's statement on page 6, third paragraph of the outstanding Final Office Action that "Doan discloses that the cathode tip 13 be coated, (lines 34-35 of column 6). In this case entire emitter is called cathode tip since cathode of Doan is basically cathode 12 wherein a conical projected part 13 is formed as emitter".

Applicant respectfully submits that Doan discloses and suggests coating the top portion of the emitter tips 13 with a work function lowering material (see col. 6, lines 34-56) such as cermet, cesium, rubidium, tantalum nitride, barium, chromium silicide, titanium carbide, molybdenum, and niobium. The only described or suggested method of sputtering only coats the

extreme tip of emitter 13 through the narrow opening in the conductive layer 15, and is for lowering the work function. This is clear from examination of Figure 7, and col. 6, lines 34 - 35.

Applicant respectfully submits that the cited reference of Doan does not disclose at least the claimed feature of “...*a single crystal silicon substrate; at least one emitter disposed above the single crystal silicon substrate comprising at least one of doped polycrystalline, microcrystalline and amorphous silicon ... the coating acts in the presence of outgassing to inhibit degradation of the at least one emitter; and a portion of the at least one emitter disposed furthest from the single crystal silicon substrate having asperities forming sharp peaks and valleys...*”, as recited in claim 1, as amended herein. The cited reference does not disclose the emitter or cathode tip 13 being of a different material than the cathode conductor 12, since the cathode tip is formed from the same material layer. The cited reference does not disclose asperities or a rough surface, or embedding a coating in any portion of the cathode tip 13, or doing anything to affect degradation of the emitter.

Applicant further respectfully submits that one of ordinary skill in the art would easily understand that Doan can not disclose or suggest the claimed feature of “...*at least one emitter ... having a coating embedded in substantially the entirety of the surface of the at least one emitter ...*”, as recited in claim 1, as amended herein. This is true because one of ordinary skill in the art would understand that there is no method whereby the cited sputtering process (col. 6, line 42) can coat anything but the region exposed by the narrow opening in the anode 15. Thus, the entire “cathode tip 13”, which reaches to the cathode layer 12, can not be substantially covered with a coating of any type by any known means. Thus, Applicant respectfully submits that the cited reference can not disclose a coating covering the whole emitter tip, especially since the Examiner states on page 6 that “the entire emitter is called cathode tip”, which would thus require the entirety of Doan’s elements 12 and 13 to be coated, which condition is physically impossible under the arrangement of the cited reference.

Applicant further objects to the Examiner’s position that the low work function material on the tip of the emitter 13 of Doan, is equivalent to teaching coating substantially all of the emitter tip 101. No one of ordinary skill in the art would understand Doan to suggest coating the entire cathode tip 13 with a low work function material, since coating the whole cathode tip 13

would promote electron generation directly below the electrode 15. Applicant respectfully submits that the arrangement suggested by the Examiner would result in an inoperative device.

Applicant respectfully submits that the cited reference fails to disclose at least the claimed feature of “...a single crystal silicon substrate; at least one emitter disposed above the single crystal silicon substrate comprising at least one of doped polycrystalline, microcrystalline and amorphous silicon having a coating embedded in substantially the entirety of the surface of the at least one emitter ...”, as recited in claim 11, as amended herein. The cited reference does not disclose the emitter being a different material than the emitter tip, or the embedded coating.

Similar language to that discussed above is found in independent claims 12-15, 18 and 26, which are thus believed to be patentably distinct for reasons similar to those given above, and further since the reference does not disclose or suggest anything regarding the outgassing.

The dependent claims are held to be patentable at least as depending upon patentable base claims. In view of the above claim amendments and discussion, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 1, 4 and 6 were rejected under 35 U.S.C. § 102(b) for anticipation by Koga et al. (U.S. 5,925,891). Applicant respectfully traverses this rejection.

Koga reference discloses low work function coated 20 cathodes 17 with withdrawn electrode 19A with a circumferential diameter smaller than the openings in the first and second insulator films 16A and 18A (Fig. 1 and col. 10 lines 23-42). Sputtered layer 20 coats the cathode 17, the bottom of the well on the substrate 11, and the top of the withdrawn electrode 19A (see Abstract, Fig. 1, col.10, line 29). Layer 20 is formed on the surface of the cathode, substrate and electrode and is not an embedded coating, but rather a “surface coating” as noted at least at column 18, line 12. The Examiner has admitted previously on page 4 that Koga does not disclose the coating acting in the presence of contamination to prevent damage, and the materials used are different.

Applicant respectfully submits that the cited reference fails to disclose the feature of “...a single crystal silicon substrate; at least one emitter disposed above the single crystal silicon substrate comprising at least one of doped polycrystalline, microcrystalline and amorphous silicon ... the coating acts in the presence of outgassing to inhibit degradation of the at least one

emitter; and a portion of the at least one emitter disposed furthest from the single crystal silicon substrate having asperities forming sharp peaks and valleys...”, as recited in claim 1, as amended herein. There is nothing in the cited reference regarding the tip being a different material than the substrate, or having asperities. The withdrawn electrode or cathode 17 is formed by etching the silicon substrate 11, and is thus the same material. Therefore, Applicant again respectfully submits that the cited reference does not disclose all of the recited features, in particular an embedded coating that inhibits degradation.

The dependent claims are held to be in patentable condition at least as depending from a base claim shown above to be patentable over the cited reference. In view of the above noted failures of the cited reference to disclose recited features of the present claims, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

§103 Rejection of the Claims

Claims 4 and 7-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. (U.S. 5,372,973) as applied to claim 1 above, and further in view of Takemura (U.S. 5,666,020). Applicant respectfully traverses this rejection.

Doan has features discussed above, and does not suggest either an emitter tip formed of a different material than the substrate, or an embedded coating, or a layer that inhibits degradation. Takemura discloses a top portion of an emitter (20a) having a highest resistance (col. 4, lines 45-48 and col. 5, lines 13-16), with platinum, titanium, tungsten, or molybdenum silicide coating (see col. 5, lines 22-25), and that the portion of the emitter closest to the tip is coated with a third material (col. 5, lines 22-23).

Applicant respectfully submits that the suggested combination of references fails to describe or suggest “...a single crystal silicon substrate; at least one emitter disposed above the single crystal silicon substrate comprising at least one of doped polycrystalline, microcrystalline and amorphous silicon ... the coating acts in the presence of outgassing to inhibit degradation of the at least one emitter; and a portion of the at least one emitter disposed furthest from the single crystal silicon substrate having asperities forming sharp peaks and valleys...”, as recited in claim 1, from which claim 4 depends. Applicant respectfully submits that Takemura does nothing to cure the above noted failure of Doan to suggest asperities, a tip having a different

material from the substrate, or embedded coating over the entire emitter. Similar reasoning applies to claim 7, from which claim 8 depends, which is thus also patentable over the suggested combination of references.

Applicant submits that one of ordinary skill in the art would easily understand that Doan can not disclose or suggest the claimed feature of a coating that acts in the presence of outgassing to inhibit degradation of the at least one emitter, as found in the claims. Applicant submits that nothing in the cited reference suggests a coating material that acts in the presence of outgassing to inhibit degradation, and there is nothing in the reference discussing outgassing. Doan's single mention of erosion at column 6, line 54, does not suggest reaction to outgassing, and the materials suggested are not the same as found in the claimed structure of the dependent claims, and thus do not disclose the "recited coating material" as suggested by the Examiner in Office Action.

The dependent claims are held to be in patentable condition at least as depending from base claims shown above to be patentable over the cited reference. In view of the above, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claim 22 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. as applied to claim 18 above, and further in view of Hush (U.S. 5,663,742). Applicant respectfully traverses this rejection.

Doan does not suggest an embedded coating as discussed above. Hush is used in the outstanding Office Action to show that field emitter devices used as a camcorder viewfinder is known. Applicant respectfully submits that Hush does not correct the failure of Doan to describe or suggest the features of "...at least one emitter having a coating embedded in substantially the entirety of the surface of the at least one emitter that releases electrons at a predetermined energy level, the coating is stable in the presence of the outgassing ...", as recited in claim 18 from which claim 22 directly depends. Thus, the suggested combination of references still fails to contain each and every feature of the claim in question.

In view of the above discussion, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney David Suhl at (508) 865-8211, or the undersigned attorney at (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

BEHNAM MORADI ET AL.

By their Representatives,

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Date

26 March 07

By



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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this ____ day of March 2007.

Name

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Signature

